

VII. *Supplemental Note on Polacanthus Foxii, Describing the Dorsal Shield and some Parts of the Endoskeleton, imperfectly known in 1881.*

By J. W. HULKE, F.R.S.

Received December 14, 1886,—Read January 13, 1887.

[PLATES 8, 9.]

IN a former paper,* descriptive of the type remains of *Polacanthus Foxii*, some account was given of its dermal armour, but the description was unavoidably very incomplete, owing to the extremely fragmentary state of the parts originally composing it. Broken up by its discoverer into pieces small enough for convenient stowage and transport in bags from the cliffs to the village of Brighstone, two-and-a-half miles distant, and then uncared for during fifteen years, the great dorsal shield, when after Mr. Fox's death his collection was acquired by the British Museum, was represented by several hundreds of disconnected pieces, many of these being of less size than one cubic inch. It was also evident that many had been lost. In this mutilated condition the reconstruction of the shield appeared hopeless, but at length, under the guidance of the heads of the Palæontological Department, this has been accomplished by Mr. HALL and Mr. BARLOW ("Masons"), who brought to the task a painstaking perseverance and skill worthy of the highest praise. Although now, doubtless, much less complete than when laid bare in the cliff by Mr. Fox, the reconstruction (which has consisted strictly in a faithful reunion of the disconnected scattered fragments) renders very intelligible the discoverer's first impression, viz., that "he had before him the carapace of a gigantic turtle," and it confirms his opinion of the position of the shield, viz., that it covered the rump and loins. The dimensions of the shield, given by Mr. Fox in a MS. note, 3 feet 3 inches by 3 feet, were taken roughly in the cliff before the shield was broken up. In its restored condition its breadth is 108 centims. in front, 105 centims. at its middle, and 48 centims. posteriorly, and its length is 90 centims.

The relation of the shield to the pelvic bones makes it evident that the carcass was lying on its belly when it sank into the ooze, and that the shield was later crushed down upon the endoskeleton and flattened out.

In its present state the outline of the shield forms a long oval figure, from which an anterior segment has been removed through a line parallel to its shorter axis. It

* 'Phil. Trans.,' 1881 (vol. 172), p. 653.

is now evident that the pieces which I described in my paper of 1881 were not all integers of the value of separate scutes, entering by overlap, or other arthro-dial articulation, into the composition of the shield, but (with the exception of the γ spines) were pieces originally synostosed in a continuous sheet, in which no traces of suture or other marks of primitive distinctness are discernible.

Near its lateral and posterior border the shield is thicker than at the middle, where it overlies the vertebral column, a fact noticed by Mr. Fox. The form of these borders is that of a smoothly-rounded lip separated from the upper surface by a narrow sunken groove. The continuous sweep of the posterior border is interrupted by a wide deep notch, having at its centre a projecting part that overhung the root of the tail. At each side of this projection is a narrow cleft; whether natural, or a crack produced by the yielding of the shield under compression, is uncertain. The anterior differs from the other borders of the shield by its attenuation to a thin edge. This circumstance, together with the truncated form of the border, suggests that the part we actually possess does not represent the complete dorsal mail, but only a posterior segment, between which and an anterior part, now lost, covering the thorax, a flexible junction may have existed somewhat like that present in the plastron of certain Chelonians.

The upper, or exterior, surface of the shield is richly ornamented. It exhibits in a highly satisfactory manner the position and distribution of the pieces described by me in 1881 as "*tuberculated*" (α) and "*keeled*" (β) scutes. The former (α) compose the general groundwork co-extensive with the whole area of the shield, which is closely studded with hemispherical tubercles averaging 5 to 1.5 centims. across their base. The β pieces, characterised by a keel-shaped elevation rising out of a circular or elliptic depression, are grouped in four longitudinal rows occupying each lateral half of the shield. The highest and stoutest part of the keel is always posterior. The largest keels form a sub-marginal lateral row; and the smallest a paired sub-median series, one in each pair lying on each side of the middle line of the shield over the vertebral column. The central elevation in this latter series resembles a low blunt cone, with circular or oval base, rather than a keel. The keels of intermediate size compose two less regular rows placed between the sub-marginal, lateral, and the sub-median series. It is now certain that the large spines (γ) do not constitute any part of the shield we possess; and since, for reasons given in 1881, they appear excluded from the caudal mail, they would seem to have occupied an anterior region of the trunk, a supposition which derives some additional probability from the position of the series of similar spines in the type-specimen of *Hylaosaurus* preserved in the British Museum.

Thin sections of the shield, mounted in Canada balsam, show an osseous structure. Near the inner surface the arrangement of the trabeculæ conforms to that of the decussating bundles of fibrous tissue observable in the cutis vera of existing Lizards. Near the outer surface sections, vertical to and parallel to this surface, show an

areolated or cancellated arrangement of the bony tissue; and here may be seen numerous vascular canals surrounded by concentrically placed lamellæ.

Thus the shield doubtless in part represents the cutis vera. It must have been invested by a vascular membrane analogous to the periosteum of the endoskeletal bones, and externally this was overlaid by an epidermal covering which sheathed the keels and spines.

Upon the inner surface of the shield are apparent in the middle line the sacrum and a series of lumbar vertebræ synostosed and forming a rigid bony rod (as described in 1881). The lower transverse processes, imperfectly known to me in 1881, are now well shown.

Those of the 2-5 sacral vertebræ average 14-15 centims. in length. Their stout, expanded, distal ends abut against the median surface of the ilia. The lower transverse processes of that which I have called the first sacral vertebra are less stout, and their direction differs slightly from that of the others; their connection with the ilia is also less evident. It is, therefore, possible that this vertebra may better claim to be the last of the lumbar series. (In *Iguanodon* this vertebra is often found synostosed with the first sacral, and so functionally composing part of the sacrum.)

Five ribs on the right side still retain nearly their normal relations with the lumbar vertebræ. They progressively shorten from before backwards, their lengths decreasing from 28 to 25 centims.; these are approximate measurements, because the distal ends of the ribs merge into and are lost in the inner surface of the shield without distinct indication of their actual termination. In their vertebral halves these ribs exhibit well the inferior ridge which gives a triquetrous figure to their cross-sections, and must have greatly increased their strength. The vertebral ends of the ribs are crossed superiorly by longitudinally disposed bundles of slender bony rods. These are manifestly ossified tendinous and ligamentous structures, similar to those which I have mentioned as occurring in *Hypsilophodon Foxii*, and to those in *Iguanodon* lately described by Mr. DOLLO.

The pelvis, of which in 1881 little was recognisable, is now worked out. The acetabula are well displayed; their large size immediately attracts the eye. The ilia are so blended with the shield that their exact form is not discernible. So far as slight textural differences of the surface warrant an inference, I am disposed to think that the præ-acetabular was longer than the post-acetabular portion, but I speak with reservation on this point. As in many Dinosaurian ilia, the pubic part of the acetabular arc of the ilium forms a strongly marked angle, from which abruptly rises the lower border of the præ-acetabular process. The remains of the os pubis are too fragmentary to give the shape of this bone, but I think that indications are recognisable of its division into a *præ-pubic* and a *post-pubic* part. Other specimens must, however, decide this.

The ischium is better preserved, the left being nearly entire. It has a compressed doubly-curved figure of simple form, decreasing from a breadth of 15 centims., where it

joins the ilium, to 4·7 centims. at its ventral or mesial end. Its direction appears to be nearly transverse to the long axis of the trunk, and not almost parallel to this, as in Iguanodonts. Whether the ischia actually met in symphysial union cannot be ascertained from this specimen, as the mesial end is missing.

EXPLANATION OF PLATES.

PLATE 8.

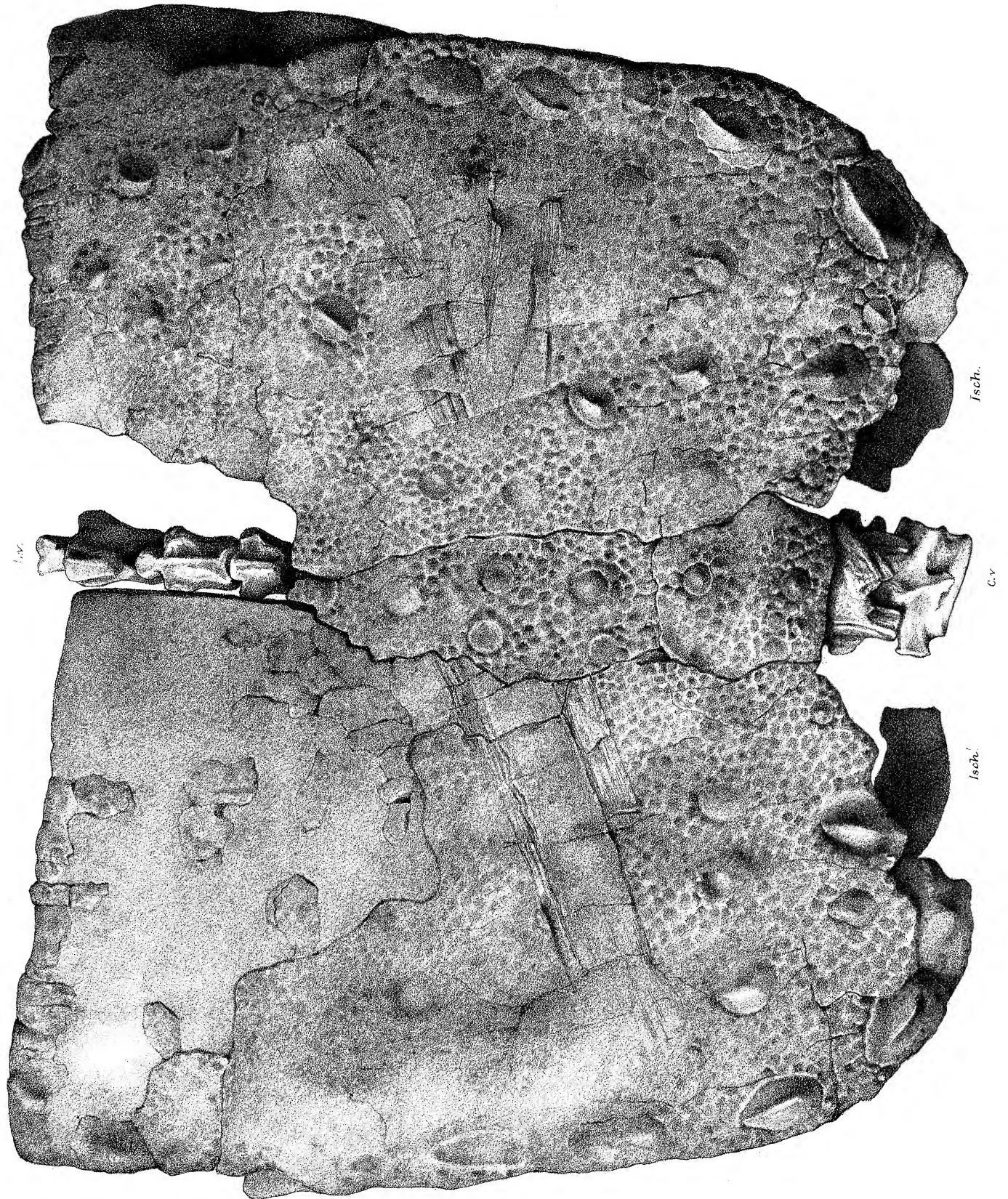
Dorsal View of Shield.

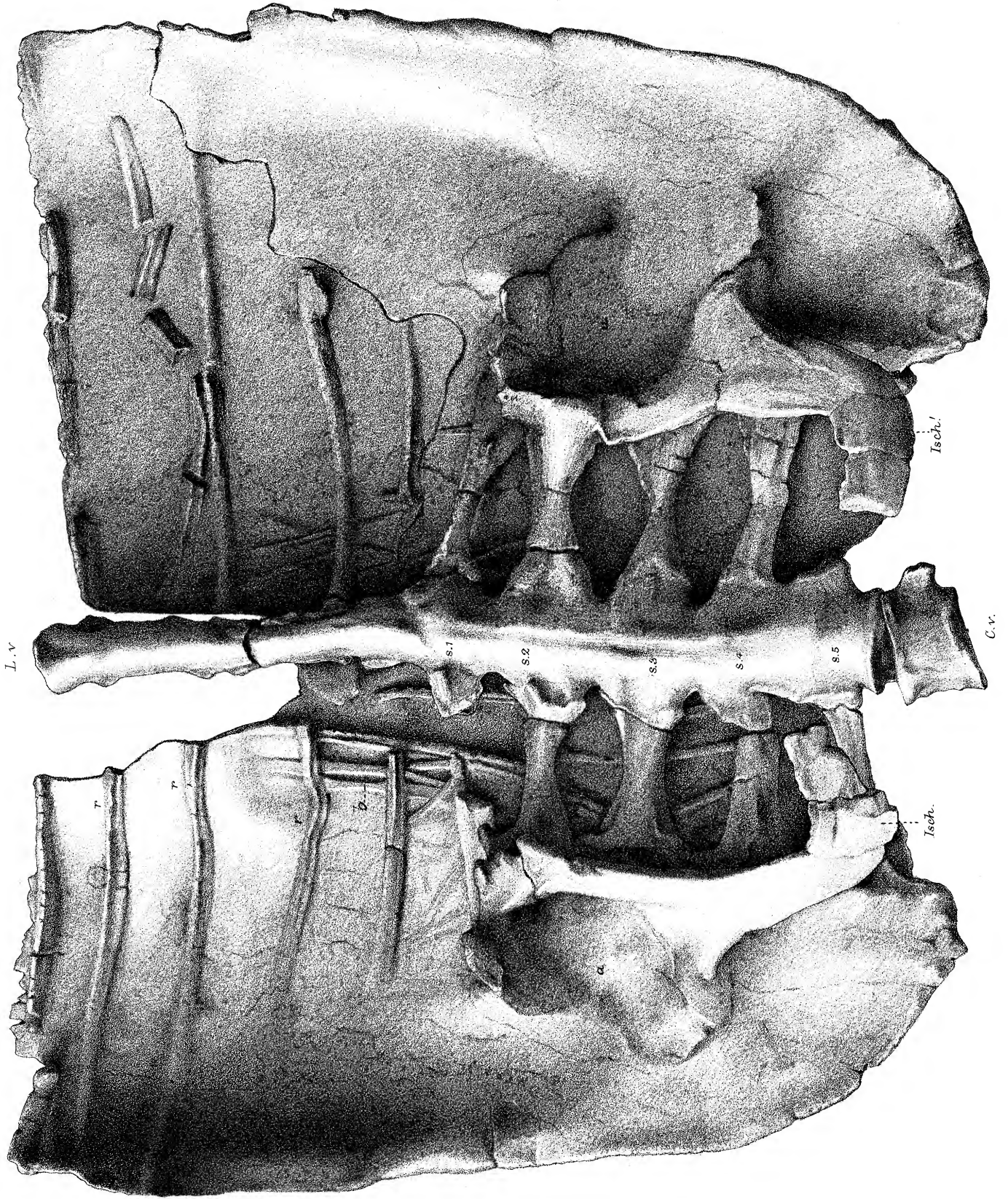
<i>L. v.</i> Lumbar vertebræ.		<i>Isch.</i> Right ischium.
<i>C. v.</i> Caudal vertebræ.		<i>Isch.'</i> Left ischium.

PLATE 9.

Ventral View of Shield and Pelvis.

<i>L. v.</i> Lumbar vertebræ.		<i>Isch.</i> Right ischium.
<i>C. v.</i> 1st caudal vertebra.		<i>Isch.'</i> Left ischium.
<i>S.</i> 1, 2, 3, 4, 5. Sacral vertebræ.		<i>r.</i> Ribs.
<i>a.</i> Acetabulum.		<i>t.</i> Ossified tendons.





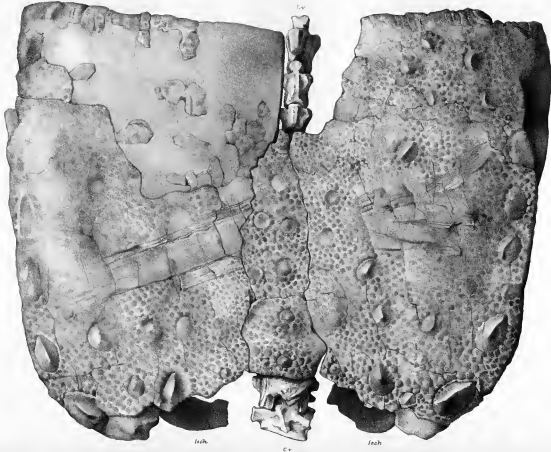


PLATE 8.

Dorsal View of Shield.

L. v. Lumbar vertebræ.
C. v. Caudal vertebræ.

Isch. Right ischium.
Isch.' Left ischium.

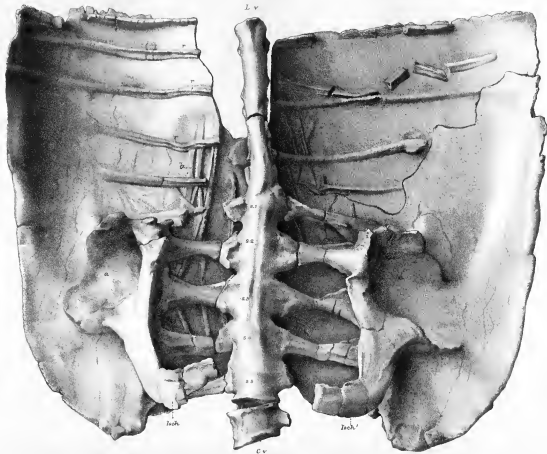


PLATE 9.

Ventral View of Shield and Pelvis.

L. v. Lumbar vertebrae.

C. v. 1st caudal vertebra.

S. 1, 2, 3, 4, 5. Sacral vertebrae.

a. Acetabulum.

Isch. Right ischium.

Isch.' Left ischium.

r. Ribs.

t. Ossified tendons.